

PAPERS.

26. On the Amphipod Genus *Leptocheirus*.

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(Plates XVII.-XIX.†, and Text-figure 146.)

The genus *Leptocheirus* was instituted by Zaddach in 1844, with the type species *L. pilosus*. So much discussion has arisen over this species that it seemed desirable to settle the matter by reference to the actual specimens, should it prove possible to trace them. Dr. Braun, in whose keeping at the Königsberg Museum they were discovered, most kindly sent them to me for examination and also granted permission to dissect and figure one of the specimens, so that the vexed question might be finally set at rest. I am deeply indebted to him, and to all those also who have so generously assisted me in this investigation : to Canon Norman, for the loan of specimens of *L. subsalsus*, *pinguis*, *hirsutimanus*, *guttatus*, and *pectinatus*; to Monsieur Chevreux for specimens of *L. cornuaurei*, *tricrostatus*, and *dellavallei*; to Dr. Kükenthal and Dr. Zimmer for permission to examine Grube's specimens of *Protomedeia hirsutimana*? and *P. guttata*; to Dr. Hjalmar Théel and Dr. Holmquist for the trouble they have taken in searching for Ohlin's specimen of *L. aberrans*; to Professor Steuer for his assistance in tracing Heller's specimen of *P. hirsutimana*; to Dr. Otto Pesta for the description and figures of this same specimen, by which its identification became possible; and to Professor Vayssière and Monsieur Collin, of Cette, for the help given in searching for Catta's specimen of *massiliensis*.

It will be noted that the number of species has been reduced.

L. cornuaurei Sowinski and *subsalsus* Norman become synonyms of the type species, the one being the full-grown male, and the other the full-grown female. Norman's record is very interesting with regard to the distribution, confirming Zaddach's account, both being for fresh or almost fresh water. All the other species of the genus, so far as yet known, are marine.

I have also shown, I hope conclusively, the identity of *L. pectinatus* Norman with *L. dellavallei* Stebbing, which indeed Mr. Walker has always maintained. *L. pectinatus* is, in my opinion, the young form sexually mature but not full-grown, while *L. dellavallei* is the fully developed animal. Figures are given of the characters on which Chevreux (16) p. 91, and Norman (36) pp. 87, 88, separated them, to prove that the differences are merely those due to sex and development. The question of distribution is also discussed by these authors in separating the species, *pectinatus* having always been found near the shore, and *dellavallei* at greater depths, but our present

* Communicated by Dr. W. T. CALMAN, F.Z.S.

† For explanation of the Plates see p. 593.

knowledge of the bathymetrical limits of any species is far too inadequate to base any conclusions upon. Grube's *hirsutimana* from the Adriatic is the same species.

L. tricristatus Chevreux becomes a synonym of *guttatus* Grube. An interesting point in this species is the varying development of different characters, notably the antennæ, the last peræopod, and the last uropods.

L. bispinosus Norman I consider identical with the species described and figured by Della Valle as *L. guttatus*. Heller's *P. hirsutimana* is to be referred to this species (see p. 585).

I have been unable to trace the type specimens of two species, *L. aberrans* Ohlin, and *Protomedea hirsutimana* var. *massiliensis* Catta. The only specimen of *aberrans*, dissected by Dr. Ohlin for the purpose of description, appears unfortunately to have been lost.

There is nothing to add to Mr. Stebbing's definition of the genus, 'Das Tierreich,' p. 625, except that the outer ramus of uropod 3 in all the species is 2-jointed, the terminal joint rudimentary.

The development of the secondary sexual characters in the male can only be definitely stated in two species, *L. pilosus* and *pinguis*; a great deal more material must be examined before it can be decided whether the rule which applies to these species holds good for the whole genus or not. In *pilosus* and *pinguis* the first gnathopod in the male is longer than the second, the hand is greatly developed, the palmar margin concave; while in the female, on the contrary, the first gnathopod is shorter than the second, and the palmar margin is convex. The full-grown female, in all the other species, agrees with this description. I find another distinction between the sexes in the type species (*L. pilosus*), in the shape of the basal joint of the 5th peræopod (see Pl. XVII. figs. 22 & 23); but as this is the only species in which I have had the 5th peræopods of both sexes, I cannot say if this distinction is generic or only specific.

The species now included in the genus are as follows, arranged in chronological order, with their principal distinguishing characters:—

1. *L. pilosus* Zaddach 1844, = *L. cornuawei* Sowinski, 1898, the ♂, and *L. subsalsus* Norman, 1908, the ♀. Pleon-segments not dentate: accessory flagellum 1-jointed: gnathopod 1 greatly developed in ♂, longer than gnath. 2; shorter than gnath. 2 in ♀; 5th joint in ♂ powerful and curved, 6th bent inwards at right angles to the 5th, palmar margin concave; palmar margin convex in ♀: finger of gnath. 2 almost straight, apex acute.
2. *L. pinguis* Stimpson 1853. Pleon-segments 4, 5, & 6 each with 2 dorso-lateral angles: accessory flagellum long, 6-8-jointed: hind margins of sideplates 1-4 serrate, spiniferous: hand of gnathopod 1 greatly developed in ♂, and much longer than gnath. 2; much shorter than gnath. 2 in ♀; palmar margin concave in ♂, convex in ♀: finger of gnath. 2 as in *pilosus*.

3. *L. hirsutimanus* Bate 1862 = *Boeckia typica* Malm 1871. Pleon-segments not dentate, the 4th with a dorsal depression: accessory flagellum 6-jointed: sideplate 1 small, hidden by the large sideplate 2: finger of gnath. 2 as in *pilosus*: fingers of peræopods 3-5 bifid: uropod 2 unusually massive.
4. *L. guttatus* Grube 1864 = *Ptilocheirus tricristatus* Chevreux 1886. Pleon-segment 4 with 3 medio-dorsal angles or teeth: superior antennæ not much longer than inferior; accessory flagellum 2-3-jointed; palmar margin convex in ♀: finger of gnath. 2 unguiform, acute: falciform processes of uropods 1 and 2 of great length: inner ramus of uropod 3 tipped with 1 spine.
5. *L. pectinatus* Norman 1869 = *Protomedeia fasciata* Costa 1864 and *L. dellavallei* Stebbing 1899: pleon-segments 4 and 5 each with 2 dorso-lateral angles: sideplate 1 small, hidden by the large sideplate 2: accessory flagellum 2-3-jointed: palmar margin, gnath. 1, concave in ♂, convex in ♀; finger of gnath. 1 exceeding the palm in length: finger of gnath. 2 straight, laminar, tipped with setæ.
6. *L. aberrans* Ohlin 1895.
7. *L. bispinosus* Norman 1908 = *Protomedeia hirsutimana* Heller 1866 and *L. guttatus* Della Valle 1893: resembles *guttatus*. Pleon-segments 4 and 5 each with 2 dorso-lateral angles: accessory flagellum 5-jointed: palmar margin, gnath. 1, convex in ♀: 2nd joint in gnath. 2 unusually long; finger as in *guttatus*: falciform processes of uropods 1 and 2 of great length: uropod 2 with two clusters of feathered setæ on the lower margin of the inner ramus.

Fam. PHOTIDÆ.

(For synonymy see Stebbing, Das Tierr. Lief. 21, p. 603.)

Gen. LEPTOCHEIRUS Zaddach.

(Stebbing, p. 625.)

LEPTOCHEIRUS PILOSUS Zaddach. (Plate XVII.)

1844. *Leptocheirus pilosus* Zaddach (53) pp. 8 & 9.
 1848. " " Müller (32) p. 62.
 1862. *Protomedeia pilosa* Spence Bate (1) p. 168.
 1873. *Leptochirus pilosus* Möbius (30) p. 117.
 1878. *Protomedeia pilosa* Zaddach (54) pp. 18 & 19.
 1888. *Leptocheirus pilosus* Stebbing (42) see p. 1707 for references.
 1898. " *cornuaurei* Sowinski (41) p. 470, pl. ix. figs. 9-22.
 1906. " *pilosus* Stebbing (44) p. 630.
 1908. " *subsalsus* Norman (38) p. 307, pl. xii. figs. 1-6.
 1910. " *cornuaurei* = *subsalsus* Chevreux (18) p. 2.

This species was fully described by Zaddach in 1844, and the accuracy of his description will be seen on comparing his account with the figures here given. In his later work, 'Die Meeres-

Fauna an der preussischen Küste,' is an interesting note on the distribution of the species. It was found, so Zaddach states, both in fresh and in salt water; by Rathke in 1843 in a large fresh-water lake, the Geserich See, and by Zaddach himself, about the same time, in the sea at Dantzig. It is not known under what circumstances Rathke obtained his specimens, whether he collected them himself near the banks, or whether they were given to him by the fishermen. Zaddach, 34 years later, dredged the southern part of the lake in search of the species, but his efforts proved fruitless.

The type² specimens are preserved in the Königsberg Museum, and are labelled "Protomedeia pilosa Zadd. Rauschen, Ostsee IX. 1866."

The next record, also from the Baltic, is that of Müller, who noted the species as not rare in Greifswalder Bodden. He pointed out the presence of a minute 1-jointed accessory flagellum on the superior antenna, which had been overlooked by Zaddach.

The next authentic record of the species is in 1898, when Sowinski described and figured the adult male as *L. cornuaurei*.

In 1908 Canon Norman described and figured the female under the name of *L. subsalsus* from specimens found by Mr. Gurney in Norfolk, in fresh or almost fresh water.

In a note published in July, 1910, Monsieur Chevreux points out that *cornuaurei* Sow. is the male of *subsalsus* Norman.

The examination of the type species which I have been enabled to make and the comparison of it with specimens of both *cornuaurei* and *subsalsus*, prove beyond question the identity of all three forms, *pilosus* being the young female, not sexually mature, *cornuaurei* the full-grown male, and *subsalsus* the full-grown female.

The specimens examined were:—

Zaddach's two types from the Baltic, measuring 4 mm. around the curve; young females, not sexually mature.

4, ♂ and ♀, from muddy piles, R. Bure, Norfolk, Canon Norman's collection, measuring 5 mm. in a straight line.

4, ♂ and ♀, from the coast of Algeria, sent by Monsieur Chevreux, measuring 4-4.5 mm. in a straight line.

Description.

Body (Pl. XVII. fig. 1) smooth, moderately compressed; pleon without teeth, but last four segments with a seta inset on either side of the median line.

Head about as long as the first two pereon-segments; lateral corners rounded, not prominent.

Eyes oval in the small specimens, almost round in the large ones. The ommatidia, which are large and few in number, are

* Prof. Braun informs me that these specimens were collected by Zaddach himself in the Baltic at Rauschen, about 35 km. northwest of Königsberg, in September 1866, and are to be regarded as the types of the species. As the original description was published in 1844, they are not, strictly speaking, types, but rather, perhaps, *meta-types*.

darkly pigmented in the centre of the eye; the outer ring in the young animal is quite colourless, though this, of course, may only be due to the fading of the pigment, little of which is left in Zaddach's specimens, while in Chevreux's it is still fresh and black.

Sideplate 1 free of sideplate 2, but not as deep and not quite half its width; obtusely rounded. Sideplate 2 the deepest of all; expanded inferiorly; in Zaddach's specimens and Norman's small one it is deeper than broad, but in the large specimens it is more expanded in proportion to the other sideplates, in the largest of all, a female, it is almost twice the width of sideplate 3; hind margin straight, front angle produced and rounded. Sideplates 3 and 4 subequal, deeper than broad, of equal width throughout; front and hind margins straight; the 5th has the anterior lobe as wide and as deep as sideplate 4, posterior lobe small; 6th and 7th small; 1-5 with a few plumose hairs and setules on the inferior margin.

Pleon.—Segment 3 the largest; the 3rd-6th each with 2 setæ, one on either side of the median line, those of the 4th and 5th segments the longest. These setæ are inset submarginally on the posterior margin in the same position as the angles or teeth of the other species. Hind margin of the 2nd segment straight; that of the 3rd rounded; inferior margins of 1-3 with plumose sensory hairs, those of the 2nd longer and more numerous; hind margins 1-3 crenulate, 2-3 crenulations each with a setule inset.

ANTENNÆ (figs. 2 & 3).—*Superior Antenna* (fig. 2) much longer than the inferior, about half the length of the body: 1st joint of the *peduncle* stout; 2nd much more slender and longer than the 1st in the large animal, in Zaddach's smaller specimen it was subequal to the 1st in length; 3rd not quite half the length of the 2nd. *Primary flagellum*: Zaddach gives the number of joints as 12, Norman as 13; one of Zaddach's specimens, the smaller of the two, had 11 joints, the other 12; Norman's largest specimen had 14; Chevreux's 14, one specimen with 14 in one antenna and 15 in the other; the difference in number is evidently due to development. The proximal joints are short, the distal ones increasing in length, each, from the 5th or 6th to the second last joint, being furnished with a stalked sensory filament in addition to the small setæ. *Accessory flagellum* not as long as the 1st joint of the primary. It consists of 1 small joint, which is so constricted near the apex as to give the appearance of a minute second joint; furnished with 3 apical setæ, one of great length, and 2 long setæ above the constriction. Zaddach completely overlooked this small appendage, which Müller was the first to note, and indeed it might, as Müller says, easily escape attention, were it not for the long outstanding apical bristles.

Inferior Antenna (fig. 3).—The proportions of the last three joints of the *peduncle* are as given by Zaddach; 3rd short, nearly twice as broad as the succeeding joints; 4th the longest; 5th a

little shorter than the 4th. The *flagellum* is about half as long again as the 5th joint: it is composed of 8 joints in Zaddach's specimens, of 10 in the larger ones, the terminal joint in all microscopic.

ORAL PARTS.—*Upper Lip* (fig. 4): apex asymmetrically bilobed.

Lower Lip (fig. 5) large; outer lobes rounded, inner lobes appear to be coalesced at the base.

Mandibles (fig. 6).—Both *cutting-plates* and *accessory-plates* divided into 4-5 strong rounded teeth, the lowest being the largest; 7 dentate spines in the *spine-row* in Zaddach's specimen, 9-10 in the large animals, the first two or three laminar. The *molar* is large and cylindrical, crown ridged with rows of teeth, and edged with flat spines, furnished with a long feathered seta above; in the figure the molar is not well represented, being bent back to show the other portion of the mandible more clearly. The *palp* is very large; 3rd joint the longest, tipped with 4 strong curved bristles, the distal inner margin furnished with a double row of finely serrate bristles.

Maxilla 1 (fig. 7) as described by Zaddach: *inner plate* large, with 1 long plumose seta; *outer plate* with 11 strong spines on its apex, 3 dentate ones at the upper angle, and the others arranged in pairs, 1 bifurcate and 1 dentate together; in the figure only one of the rows can be shown. The 2nd joint of the *palp* widens towards the truncate apex, which is furnished with 4 strong short spines inset apically, and a diagonal submarginal row of 4 setæ.

Maxilla 2 (fig. 8) as large as maxilla 1; *inner plate* the smaller; the apices of both plates carry long curved stiff bristles; the inner margin of the inner plate has 2 rows of plumose setæ, setting out at different angles, one row containing 3 times as many setæ as the other.

Maxillipeds (fig. 9).—*Inner* and *outer plates* well developed; *inner plates* narrowed distally, the truncate apices inset with 3 flat spines, outer margins with 3 setiform spines distally; a row of 7 long jointed plumose setæ crosses each of the plates diagonally from the outer angle of the apex to the inner margin, extending more than halfway down the latter. The *outer plates* are widened distally; in Zaddach's specimen the plate on the right side is furnished with 1 long plumose seta apically and 8 graduated strong spines along the inner distal margin; the plate on the left has 2 of the plumose setæ apically, and 7 of the graduated spines; the outer surface carries numerous stiff curved bristles along the inner margin. *Palp*, 2nd joint much the largest; 3rd much produced on the inner surface over the insertion of the finger; finger small, obtuse, tipped with strong serrate setiform spines. The 2 basal joints and the 1st-3rd joints of the palp are provided on the outer surface with numerous long delicate plumose setæ.

The *First Gnathopod* (figs. 10-15) is longer than the second in the male, shorter than the second in the female. It is characterised by the remarkable development of the 5th-7th joints

in the male. In the female (fig. 11) the hand is shorter than the preceding joint and lies in the same plane with it, but in the male it is a quarter as long again as the 5th joint, and is carried bent at right angles to it (fig. 12). The finger differs also: in the male it is much stouter, more curved, and with a depression in the inner margin proximally. The long 2nd joint is furnished with a cluster of long delicate setæ on the posterior margin, and a row of short plumose setæ on the anterior margin, with another row of longer similar ones on the inner surface. 3rd joint bulging behind; 3rd and 4th fringed posteriorly with long plumose setæ; 5th joint with transverse rows of plumose setæ, and 4 fan-like clusters of rigid serrate bristles on the posterior margin. These bristles (fig. 15) are found on the 5th joint of the first gnathopod in all the species of the genus. The 6th joint or hand is subequal to the 5th in length in the immature specimen (fig. 10); distally widened; palm slightly oblique; palmar margin microscopically pectinate, palmar angle with a row of spines on the outer side, and 1 large spine on the under side, with the tip of the finger fitting between them. The outer row consists of 6 graduated slender spines, the first much the longest, the shafts of which are produced apically into two unequal processes, with a flat, delicate, feathered end-piece between the processes. In one specimen there were 6 on one gnathopod and 7 on the other. On the inner side of the palmar angle a very large stout sensory spine is inset, accompanied by 4 short stumpy bristles similar in construction to those of the outer row. A row of these stumpy bristles is found submarginally on the under surface of the palm, and 3 or 4 rather larger ones on the outer side. The finger in the young (fig. 10) is stout and curved, as long as the palm, also microscopically pectinate, with a short decurrent tooth near the apex, 2 setæ inset in the notch, 1 smaller tooth behind, and 1 setule proximally. The full development of the finger of the female is shown in fig. 13 and of the male in fig. 14.

Second Gnathopod (figs. 16-18).—2nd joint very long, laminar, with two rows of exceedingly long plumose setæ anteriorly, one marginal, and the other submarginal on the under surface; posterior margin with only 3 or 4 long simple setæ. A chitinous ridge extends diagonally across the distal half of this joint, and terminates at the posterior angle of the 3rd; this appears to be the "crista" referred to by Zaddach ("in superficie externa crista quadam a basi secundi articuli ascendente"). The 4th, 5th, and 6th joints are practically subequal to each other in length; distal margin of the 4th joint with very long plumose setæ on the under side; posterior margins of the 5th and 6th with fan-like clusters of short, stiff, finely serrated setæ, anterior margins with long plumose setæ, the number of which increases a little with growth, the smallest specimen having 9 on the 6th joint and the largest 11, 3 on the 5th joint in all specimens. The 6th joint is slightly narrowed distally. The finger is almost

straight, the tip curved and 2 setules inset subapically. I have given figures (see figs. 17 & 18) from both Zaddach's and Norman's specimens drawn to the same magnification.

Pereopods 1 and 2 (figs 19 & 20) glandular; 4th joint very much expanded, as noted by both Zaddach and Norman; 6th joint as long as the 4th, but much narrower; 5th only half the length; finger strong, two-thirds the length of the preceding joint, with the gland-aperture at the tip.

Hinder Pereopods (figs. 21-23) rapidly increase in length; the 6th joint in all is much narrower and longer than the preceding. In pereopod 3 the joints are stout and short, furnished with a few strong sensory spines; 2nd joint obliquely oval, about as wide as long, the anterior margin inset with 3 clusters of jointed sensory ciliated hairs, posterior margin slightly crenulate, with a setule in each crenulation, and with 4 plumose hairs submarginally; finger about half the length of the 6th joint, falciform. In pereopod 4 the 2nd joint is oval, longer than wide, anterior margin with clusters of the sensory plumose hairs, posterior margin crenulate, with a submarginal row of close-set long ciliated hairs. In pereopod 5 there is a remarkable difference in the shape of the basal joint in the male and female. In the female the joint is oval, the posterior expansion narrowing distally, while in the male it widens distally and is produced downwards in a rounded lobe, but the curious part is that the ciliated sensory hairs, instead of being inset close to the margin as in the female, are at some distance from the margin on the under surface, but yet give the same outline as in the female (*cf.* figs. 22 & 23).

Pleopods (fig. 24).—Inner rami twice the length of the peduncles; outer rami the shorter, about three-quarters the length of the inner. The peduncles of the 1st pair of pleopods carry each on the outer side 9 long plumose hairs, on the inner side 1 exceedingly long plumose hair and 2 small coupling-spines with recurved apices, the upper one (fig. 24) with 3 recurved teeth on either side, and the lower with only 2. The peduncles of the 2nd and 3rd pairs have only 1 or 2 long setæ on the outer side. The number of joints in the outer ramus is 11 in the 1st pleopods, 10 in the 2nd and 3rd; in the inner ramus 10 in the 1st, and 9 in the other pairs.

Uropods (fig. 25) extend backward to the same level; 1st and 2nd pairs much alike in construction. The peduncle of the 1st is as long as the inner ramus, with 3 or 4 spines on the upper curve (3 in the small specimen, 4 in the larger), and 1 curved spine underneath, and the falciform apical process reaching to half the length of the inner ramus; outer ramus the shorter, 1 spine inset on the upper margin, apex blunt with a cluster of 4 stout spines; inner ramus with a similar apical cluster and 2-3 along the upper margin. In uropod 2 the peduncle is not as long as the inner ramus; it equals the outer in length and carries 1 spine; rami as in uropod 1. In uropod 3 the peduncle is subequal to the rami in length, outer ramus, if anything, slightly longer than the inner, with a

cluster of setiform spines at the apex; inner ramus with 1 spine midway, and 1 spine and 2 setæ at the apex; the large animals have more spines; all the spines are short and stout, each with an apical filament. The outer ramus is 2-jointed, the terminal joint rudimentary, carrying 1 long serrate spine or bristle.

Telson (figs. 25 & 26) short, broader than long, depressed in the middle between the prominent lateral angles; apex rounded; 1 seta and 1 ciliated sensory hair on each angle, and a pair of small ciliated hairs on either side.

Colour described by Zaddach as "flavescens, dorso punctis nigricantibus sparso." In both his specimens and Norman's the colour has faded, but in Chevreux's it is still fresh and vivid. The whole animal is a beautiful golden yellow tint with stellate markings in dark brown. These markings extend over the whole dorsal surface of the head; the anterior margin of the 1st, and the posterior portions of the 3rd-7th pereon-segments and the 1st pleon-segment are banded with them. The 5th and 6th pleon-segments and the telson are entirely covered. An irregular band of brown runs along each side of the pereon just above the side-plates and is continued along the epimera of the pleon to the telson. All the side-plates and the posterior expansions of the basal joints of the hinder pereopods have each a patch of brown.

Distribution :—

GESERICH SEE, Prussia; and the BALTIC: Zaddach (53) as

L. pilosus, and (54) as *Protomedeia pilosa*.

BALTIC: Greifswalder Bodden, Müller (32) as *L. pilosus*.

BALTIC: Möbius (30) as *Leptochirus pilosus*, depth 1-10 fms.; bottom, zostera and ulva.

R. BURE, Norfolk, England: Norman (38) as *L. subsalsus*.

The BOSPHORUS: Sowinski (41) as *L. cornuaurei*.

Coast of ALGERIA: Chevreux (18) as *L. cornuaurei*.

LEPTOCHEIRUS PINGUIS Stimpson. (Plate XVIII. figs. 10-12.)

For synonymy see Stebbing, Das Tier. pp. 627 & 738, and Norman (38) p. 309.

There is little to add to the summary of characters given by Stebbing. The few notes subjoined were taken from three slides kindly lent to me by Canon Norman, and prepared by him from specimens from Vineyard Sound and Long Island, N. America.

Head, ♀, lateral corners not much produced, truncate.

Superior Antenna.—1st and 2nd joints in ♂ and ♀ practically subequal to each other in length; 3rd a little more than one-third as long as 2nd. *Primary flagellum*, ♀, broken, 21 joints remaining, all, except the first 6, with a small sensory filament and short setæ; 6 very long joints in the *accessory flagellum* which equals 3 joints of the primary in length. In the male, the primary flagellum is composed of 31 joints, each, except the first 5, with a small sensory filament. The accessory is broken, 6 joints remaining, equalling 5 joints of the primary in length.

Inferior Antenna, ♀.—3rd joint short and broad, with 2 sensory spines on the upper distal angle; 4th joint the longest; flagellum longer than 5th joint, equal to 4th; 11-jointed in this specimen, each joint with a cluster on either distal angle of setiform spines and very long setæ.

Lower Lip, ♀, outer lobes rounded, densely setose; inner lobes coalesced, large, distally narrowed.

Mandible, ♀: *cutting-plate* on the right side produced below, margin divided into 4 rounded teeth, the lowest the largest; *accessory-plate* much as in *pectinatus*, tapering from the base to the long acute tip, with 2 very minute teeth above; 17 spines in the *spine-row*, the first 4 large, the last 2 very small. *Molar* prominent; crown reniform in shape, edged with strong teeth, and carrying a small accessory process on the side nearest the cutting-plate. *Palp*: 2nd joint longer than 1st; 3rd the longest, curved, falciform, attenuated distally, and armed as in the type species with 4 long stiff curved bristles apically, 2 dense rows of similar shorter bristles on the inner margin, and about 4 clusters on the outer margin. The left mandible was broken.

Maxilla, 1 ♀, much as in the type species; *outer plate* in one maxilla with 11 strong spines, 3 dentate ones at the upper angle, and the others set in pairs, 1 bifurcate and 1 dentate together; in the other maxilla there were 12 spines.

Maxilla, 2 ♀, as in *pilosus*; *inner plate* narrowed distally.

Maxillipeds, ♀, covered with numerous long setæ. The basal joints, and the 1st joint of the palp, on the outer side carry fan-shaped groups of exceedingly long plumose setæ; the outer side of the 2nd joint of the palp is also covered with them, and carries in addition a fringe along the inner margin. *Outer plate* expanded distally, densely fringed on the inner margin with slender spines, the apical ones of great length. *Inner plate* elongate, tapering distally to the narrow truncate apex; 3 flat spines are inset in the apex, almost hidden by the plumose setæ surrounding them; the outer margin is furnished with a row of about 10 simple setiform spines, and the inner carries a row of 18-20 very long, flexible, plumose setæ. The 2nd joint of the *palp* much the longest, much wider and about twice as long as the 3rd; the 3rd produced over the 4th as in the type species; 4th small, tipped with strong serrate spines.

First Gnathopod, ♀.—5th joint very long, provided on the posterior margin with transverse rows of feathered setæ, and the clusters of stiff serrate bristles found in all the species of the genus; 6th joint subequal to the 5th in length, as described by Stebbing; palmar margin convex, serrate. On the outer side, extending from the angle nearly to the middle of the palm, is a graduated row of bristles, 7 in number, similar in structure to those of the type species; a row of smaller bristles is inset submarginally along the palm. On the inner side, at the palmar angle, is a short, very broad, sensory spine, and a submarginal

row of about 17 very small bristles, like those of the outer side. The finger is exactly the length of the palm; being closed in the specimen examined, the detail could not be seen, owing to the palmar spines obscuring it.

This gnathopod in the male differs from that of the female, as in the type species. The 5th joint is longer in proportion; the 2nd and 6th joints shorter. The 5th joint equals the basal joint in length. The 6th is not quite two-thirds its length, and in the natural position is held bent almost to a right angle with the preceding joint. It is expanded distally; front margin very thick; hind margin laminar, convex on the upper surface, and furnished with six transverse rows of sensory setæ; palmar margin transverse, concave instead of convex, furnished with the submarginal rows of bristles along the margin, and the graduated group at the angle as described for the female; the very stout strong spine defining the angle is much larger than in the female. On the under side of the hind margin of the 5th joint (not the "basal joint" as given by Holmes (26) p. 522), distally, a chitinous spine-like process is developed; another similar but smaller one is on the 6th joint proximally, with a groove beside it, into which the larger one appears to fit when the hand is bent in. In order to show these processes, the hand is represented (fig. 10) with the hind margin uppermost, and, in consequence of being placed in this position, the true measurements of this joint cannot be seen; viewed from the side, it is exactly the same width proximally as the 5th, expanding gradually to the palmar margin. The finger in the male is much more arched than in the female, and when closed, the tip, instead of meeting the angle as in the female, impinges against the under surface of the hand; it is finely serrate, with a row of setules inset, and apparently a small auxiliary tooth near the apex, but this was too obscured by the overlying palmar bristles to be ascertained with any certainty.

Second Gnathopod (fig. 11) as figured by Norman. The finger is about half as long as the preceding joint, lightly curved, acute, of the same structure as in the type species; with 4 setæ on the inner margin, and a cluster of 3 subapically in the male; fewer setæ in the female.

Pereopod 5.—The finger is of unusual length, considerably longer than those of pereopods 1 and 2; very slender, almost straight, with a setule near the apex.

Uropod 3 (fig. 12), ♀.—A figure is given of the rudimentary 2nd joint of the outer ramus, with the spines omitted.

LEPTOCHEIRUS HIRSUTIMANUS Spence Bate. (Plate XVIII. figs. 13-16.)

The synonymy as given by Stebbing, *Das Tier*, p. 627, omitting the references to Heller 1866, and Grube 1866, and adding:—*L. pilosus* Norman and Scott (36) p. 87.

The animal described by Heller as *Protomeidea hirsutimana* is

a female of *L. bispinosus* (p. 585): Grube's specimens proved on examination to be *pectinatus* (see p. 577).

Sars has given an excellent description and figures of this species, (40) pl. 197, to which it is only necessary to add one or two details.

Superior Antenna, flagellum furnished with very long sensory filaments.

First Gnathopod (fig. 13).—The palm is oblique, serrate, with its limit defined, as in *pectinatus*, by a large sensory spine inset on the under side. The tip of the finger reaches to this spine. The palm carries a small strong spine on the outer side, close to the insertion of the finger.

Second Gnathopod.—The finger (fig. 14) is exactly as in the type species, cf. Pl. XVII. figs. 17 & 18.

Hinder Peræopods.—Sars figures the finger of peræopod 5 only as bidentate, but the finger in all three hinder peræopods is of the same structure (see fig. 15). Spence Bate in his original description notes it for the 3rd peræopod, (1) p. 169; and Malm, (27) p. 546, describes and figures it for all three.

Uropod 3 (fig. 16).—The outer ramus is 2-jointed, as in all the other species of the genus, but the 2nd joint is exceedingly small and very difficult to observe except from the dorsal view, owing to the apex of the 1st joint being produced beneath it.

LEPTOCHEIRUS GUTTATUS Grube. (Plate XVIII. figs. 1–9.)

1864. *Protomedeia guttata* Grube (23) p. 63.
 1866. " " " (24) p. 408, pl. x. fig. 3
 1885. " " Carus (6) p. 417.
 1886. *Ptilocheirus tricristatus* Chevreux (9) p. xl.
 1887. " " " (10) p. 3.
 1887. " " " (11) p. 310, pl. v. figs. 3 & 4,
 and fig. 4 in the text, p. 578.
 1888. *Leptocheirus guttatus* Stebbing (42) p. 366.
 1898. " " Chevreux (15) p. 481.
 1900. " " " (16) p. 92.
 1906. " *guttatus* Stebbing (44) p. 629.
 " *tricristatus* Stebbing (44) p. 629.
 1906. " *guttatus* Norman & Scott (36) p. 85, pl. ix.
 figs. 4–7.
 1907. " *guttatus* Norman (37) p. 369.
 1910. " *tricristatus* Chevreux (18) p. 2.

The specimens examined were:—

1 ♀, Grube's type specimen, 5.5 mm. long, from Breslau Museum.

3 ♀ *L. tricristatus*, taken by Monsieur Chevreux in the Bay of Quiberon, the largest measuring 4.5 mm.

9 taken by Canon Norman at Falmouth, the largest ♀ measuring 6.25 mm.

The type specimen from Breslau has Dr. Grube's original label

still on the bottle—" *Protomedeia guttata* Gr. m. Eiern, Lorenz, Val Cassione $\beta\beta$." It is a female, 5.5 mm. in length from the tip of the rostrum to the tip of the telson, with the pigmentation still vivid after 48 years in alcohol. I have described this specimen in detail, the account of the specific characters given by Grube not being sufficiently adequate for the present system of classification. In the figure of the whole animal it must be noted that as all the appendages were drawn *in situ*, the *exact* measurements and proportions of the joints of the peræopods cannot be expected. Each character is compared with Chevreaux's specimens of *tricristatus* to prove the identity of the two forms.

Description.

Body (Pl. XVIII. fig. 1) more stoutly built than in *pilosus* and *pectinatus*, and sideplates shorter in proportion than in those species.

Head longer than the 1st and 2nd peræon-segments taken together; lateral corners not prominent, rounded.

Eyes round, black or brownish-black in colour; ommatidia large.

Sideplates 1-5 subequal to each other in length. Sideplate 1 not covered by sideplate 2; produced forward over the side of the head, of equal width throughout; inferior margin obtusely rounded, with 3 or 4 stiff, sparsely feathered setæ inset; hind margin, as in the type species, not continuous proximally. Sideplate 2 the largest, a little expanded distally, front angle and inferior margin rounded, hind margin straight; inferior margin fringed with a row of flexible, finely plumose setæ. Sideplates 3 and 4 alike in form, deeper than broad, slightly wider proximally; sideplate 5 with the anterior lobe about as deep as preceding sideplate, but not as wide; inferior margins of all three carry a few setæ, similar to those on sideplate 1. Sideplates 4 and 5 small.

Pleon.—Segment 3 much the largest, as long as segments 1 and 2 taken together. The 4th segment has the armature characteristic of this species: the posterior margin is produced in 3 processes, the median one upstanding, acute, shorter than the lateral ones; the latter broad at the base, much produced over the succeeding segments, apices acute, curving upwards, with a spinule inset in each. Segments 5 and 6 are small, the posterior margin of the 5th with a few setules dorsally. The hind margin of the 2nd epimeron is straight, with 1 crenulation and setule at the postero-lateral angle; inferior margin densely fringed with long plumose setæ. The hind margin of the 3rd is produced and rounded, with 2 indentations, a setule in each; inferior margin lightly concave, with 3 long plumose setæ inset midway, and 3 short spines near the antero-lateral angle.

ANTENNE. *Superior Antenna* (figs. 2-4).—1st joint of the peduncle stout, shorter than the 2nd; 3rd not quite half the length of the 2nd. *Primary flagellum* 7-12-jointed, the largest female had 11 joints; *accessory flagellum* 2-3-jointed. I must note here an occasional

curious variation in the number and proportions of the joints of the flagella in the same animal. This variation occurs, I believe, not infrequently in the Amphipoda, some species of *Jassa*, for example, having usually one joint more on one side than on the other. In Grube's type specimen the primary flagellum on the right side has 8 joints, 7 on the left; the right flagellum of the inferior antennæ has 4, while the left has only 3; the accessory flagella are both 2-jointed, but the one on the left antenna is longer than that on the right. Grube evidently counted the joints of the antennæ on the left side. In two other specimens examined, females of the same size, the superior antennæ were the same length, but in one case there were 12 joints, and in the other only 9; the accessory flagellum in both was 3-jointed, but whereas in the animal with 12 joints it exceeded the 2nd of the primary in length (fig. 4), in the other it did not reach to the level of the 2nd. Figures 2 and 3 are from another specimen, the right accessory of which had 2 joints, the left 3. All the joints of the primary, except the first 4, are provided with a sensory filament in addition to the setæ.

Inferior Antenna.—4th joint of the peduncle the longest; flagellum a little longer than the 5th, subequal to the 4th in length. *Flagellum* 3-6-jointed, the first the longest.

First Gnathopod (fig. 5).—Hand about twice as long as broad; palm oblique, defined, as in *pectinatus*, by a large sensory spine inset on the under surface; palmar margin convex, serrate, the serrations turning the corner and ending at the level of the spine, it carries 5 or 6 small sharp spines submarginally on the outer surface, and 8 smaller ones on the inner, all microscopically serrate. The finger is as long as the palm, curved, serrate, with 2 auxiliary teeth.

Second Gnathopod (fig. 6).—2nd joint very long, equalling in length joints 4-6 taken together. The 4th joint, as is usual in the genus, is much produced over the 5th on the inner side, and if the measurements are taken along this side, the 4th, 5th, and 6th are seen to be subequal to each other; Chevreux's figure (pl. v. fig. 4) shows the outer side. The finger is about three-fifths the length of the preceding joint, lightly curved, with 2 setules near the acute apex.

Peræopods 1 and 2 alike in structure, glandular, resembling the type species in the shape and proportions of the joints except that the 5th joint is slightly longer in proportion than in *pilosus*, and the finger is much longer and more slender, being equal in length to the posterior margin of the preceding joint.

Hinder Peræopods very like those of the preceding species, but stouter and much less elongate. Norman gives "the greatly produced last peræopod" as a specific character, but in most of the animals examined by me the proportions are much as figured in Grube's type specimen (fig. 1); in the others the 6th joint is more developed. The basal joint in all is large, rounded oval, produced downwards in a lobe, furnished anteriorly with short spines at intervals and ciliated hairs, and a dense cluster of the latter at the

distal angle; the posterior margins of the 3rd and 4th joints are crenulate, 6-9 crenulations each with a setule. In the 5th this margin has 5-7 serrations, and 1-3 ciliated hairs inset in the lobe. The 3rd joint carries a dense cluster of ciliated hairs at the anterior distal angle; and the 5th joint a similar cluster of feathered setae. Fingers short and curved. In pereopod 3 the 4th joint is slightly longer than the 6th and wider; 5th shorter than 4th; 6th with groups of short spines. In pereopod 4, the 4th and 6th joints are subequal to each other in length; in one or two of the larger specimens the 6th is slightly the longer; it carries numerous spines and a cluster of very long setae at the distal angle. In pereopod 5, the 4th, 5th, and 6th joints rapidly increase in length; the 6th is slender and lightly curved, inset on its posterior margin with exceedingly long setae in addition to the spines.

Pleopods much as in *pectinatus*, except that the peduncles are shorter in proportion to the rami, about one-third as long, and the outer ramus is only two-thirds the length of the inner; cleft spines as in *pectinatus*, 5 in the 2nd pleopod; coupling-spines with 2 rows of recurved teeth in addition to the recurved apex, 3 teeth in a row in the lower spine, 2 in the upper.

Uropods (figs. 7 & 8).—There is a marked variation in the length of the uropods in different specimens, most noticeable in the 3rd pair, connected apparently with the variation in the development of the last pereopod. In Grube's specimen (fig. 8) the peduncle of uropod 3 is short and broad, shorter than the outer ramus; inner ramus not quite half the length of the outer. Some of Norman's and Chevreux's specimens are like Grube's type; in others, the peduncle equals the outer ramus in length and the inner ramus is nearly as long as the outer; while in the largest specimens with the last pereopods much produced, the peduncle of uropod 3 is longer than the peduncle of uropod 2, and longer also than the rami, both rami long and slender, inner quite equal to the outer in length. Uropod 1, peduncle shorter than outer ramus, the falciform process of unusual length, reaching almost to the tip of the outer ramus, furnished with 5 spines along the upper curve; outer ramus a little shorter than the inner, with 3 spines and an apical cluster of 5, 3 of which are longer than the others; inner ramus with 4 spines and a similar apical group; these spines are longer and more slender than those of uropod 2. Uropod 2 stoutly built, peduncle short and stout, with the falciform process equalling the outer ramus in length; outer ramus shorter than the inner, with 2 spines, inner with 3, each with an apical cluster of 5 strong stout spines (fig. 7). Uropod 3, peduncle produced underneath in a flat laminar expansion; outer ramus with a rudimentary 2nd joint carrying 1 long stiff sparsely feathered bristle; the 1st joint has a group of graduated similar bristles almost concealing the terminal joint; inner ramus slender, tipped with 1 stout spine. This description of uropod 3 applies to all the specimens examined by me.

Telson (fig. 9) as figured by Chevreux and Norman: the apical

margin is convex; from the dorsal view it appears truncate, *cf.* also *bispinosus* p. 589.

Colour.—Chevreux in his original description gives the colour as yellowish with some brown spots; in his later account he describes it as generally uniform yellow, some specimens with brown bands dorsally. In Grube's type the colour is still vivid, tawny yellow, with round stellate markings in light and dark reddish-brown. These markings occur on the head; in transverse bands on segments 2-10; on the sideplates; and on the posterior expansion of the basal joints of the hinder peræopods.

Distribution:—

CHANNEL ISLANDS: Norman (37) p. 369, as *L. guttatus*.

FALMOUTH HARBOUR: Norman & Scott (36) p. 86, as *L. guttatus*.

Oceanic Coast of FRANCE: Chevreux (11) p. 311, as *Ptilocheirus tricristatus*, depth 7 m.; bottom deposit, gravel with coral-lines; (12) p. 578, depth 10 m., bottom deposit, nullipores; (15) p. 481, as *L. guttatus*, depth 10-50 m.

MEDITERRANEAN:—Coast of FRANCE: Chevreux (16) p. 92, as *L. guttatus*. Coasts of ALGERIA & TUNIS: Chevreux (16) p. 92, as *L. guttatus*; (18) p. 3. ADRIATIC: Grube (24) p. 408, as *Protomeidia guttata*.

LEPTOCHEIRUS PECTINATUS Norman. (Plate XIX.)

The principal references to this species are as follows:—

1864. *Protomeidia fasciata* (non Kröyer 1842), Costa (19) p. 155, pl. ii. fig. 8.
1864. *Protomeidia* Kr.
1864. *Leptocheirus pilosus* Grube (22) p. 73.
1866. *Protomeidia hirsutiniana*? Grube (24) p. 402.
- " *pilosa* Grube (24) p. 417, pl. x. fig. 2.
1869. " *pectinata* Norman (34) p. 283.
1887. *Ptilocheirus pectinatus* Chevreux (11) p. 309.
1888. *Leptocheirus pectinatus* Stebbing (42) p. 1707 for references.
1893. " *pilosus* Della Valle (21) pp. 427-430, pl. iv. fig. 10; pl. xii. figs. 1-14.
1895. " " Walker (47) p. 470.
1895. " " " (48) p. 310.
1899. " *dellavallei* Stebbing (43) p. 350.
1900. " *pilosus* Chevreux (16) p. 90.
- " *fasciatus* Chevreux (16) p. 91.
1906. " *dellavallei* Stebbing (44) p. 628.
- " *pectinatus* Stebbing (44) p. 629.
1906. " " Norman & Scott (36) p. 87, pl. ix. figs. 1-3.
- " *fasciatus* Norman & Scott (36) p. 88, pl. v. figs. 11 & 12.
1908. " *dellavallei* Norman (38) p. 310.
- " *pectinatus* Norman (38) p. 310.
1909. " *pilosus* Walker (51) p. 341.

The specimens examined were :—

- 3 *L. pectinatus*, two females and one male, measuring 2·5–3 mm. ; from Guernsey, sent by Canon Norman.
- 1 specimen, ♀, 4·5 mm., taken by the 'Huxley' in 109 fathoms, during her cruise on the north side of the Bay of Biscay, 1906.
- 3 *L. dellavallei*, ♂, 5–6 mm., from the coast of Senegal, from Monsieur Chevreux.
- 3 specimens from Breslau University Museum, referred to above. These latter specimens were sent in two bottles with Dr. Grube's original labels still on them. One bottle, marked "*Protomedeia pilosa* Zadd. ♀. Luss. picc. Mundtheile. Grube," contained two tubes, with one specimen in each. One of these, a female almost ready to moult, with a brood of young just hatched, was dissected, and is evidently the specimen from which Grube made his drawings. That this is so can be proved by a comparison of the figures with the dissections: *e. g.*, the shape of the 2nd maxilla in his figure is due to the fact that a portion of the inner plate with most of the feathered bristles had been torn away (*cf.* (24) pl. x. fig. 2 m¹, with fig. 10); and again, in the 1st maxilla he notes the absence of the apical seta, which seta is, however, there, but too completely masked by dirt to be seen, except under a high power. The other tube contained a female 5·5 mm. long. The second bottle was originally marked "*Protomedeia hirsutumana* Sp. B. ♀. Vollst. Luss. picc. Grube," but over the "*hirsutumana*" is written in a different ink "*pilosa* Zadd." and the words "*m. Eier*" added, apparently by Grube himself. The tube in this bottle contains a large, brightly-coloured female, the largest specimen I have yet seen.

The specimens form a most interesting developmental series in the order in which I have arranged them above. Figures 14, 19, & 23 are taken from a female *pectinatus* 2·75 mm., figs. 1 & 13 from a male 2·5 mm. long, Norman's specimens: figs. 3, 16, 17, 25, & 28 are from the female specimen described by Grube: the other drawings are from two males, *dellavallei*, 5·25 and 6 mm. respectively, Chevreux's specimens. The *pectinatus* figures are more magnified than the others for the purpose of comparison.

Description.

Head not quite so long as peræon-segments 1 and 2 taken together; lateral corners not prominent, truncate.

Eyes almost round, a little drawn out towards the lateral angle; ommatidia few in number, large, with blackish-brown pigment in the centre, outer row not so darkly pigmented.

Sideplates (figs. 13–16).—The first sideplate, which has been the principal character for separating the two forms *pectinatus* and *dellavallei*, is of exactly the same structure in all the specimens. It is small, and completely hidden by sideplate 2.

(Through some mischance, Norman's figure of the first gnathopod ((36) pl. ix. fig. 2) shows the *second* sideplate attached instead of the first.) The first sideplate is subquadrate in the young animal, with 1 long sensory spine inset at the anterior angle, but with growth this angle becomes more produced downwards, until in the largest specimen of all the anterior margin of the sideplate is half as long again as the hind margin. Four stages of development are represented in the figures. The 'Huxley' specimen forms the link between figs. 14 & 15; the anterior angle is not so much produced as in the latter, 6 setules are inset anteriorly, 1 inferiorly, and 3 short sensory hairs at the posterior angle. In Grube's specimens, the anterior margin is lightly concave and the posterior angle has a strong chitinous margin. The hinder portion of the sideplate is firmly affixed to the basal joint beneath, so firmly in fact as to make it impossible to separate them without destroying the shape of the sideplate. A delicate laminar plate extends beyond the sideplate behind, and is all but continuous with it proximally, the line of demarcation being barely distinguishable. Sideplate 2 is the largest of all, as deep as broad in the small specimens, a little deeper than broad in the fully developed animal; front margin rounded; hind margin almost straight with 4 small setæ inset; inferior margin rounded, thickly fringed with delicate, sensory, cleft-tipped setæ of varying lengths (26 in the young, to about 41 in the full-grown). The remaining sideplates are very like those of the type species. Sideplates 3 and 4 are subequal to each other in length, shorter than the 2nd, about half as deep again as broad. The 3rd is of equal width throughout, front and hind margins straight, the latter with three or four setæ inset; inferior margin convex, fringed with 10-19 of the sensory cleft setæ. The 4th is a little wider proximally than the 3rd, and the front margin is lightly convex; inferior margin with fewer sensory setæ, 5-15. In sideplate 5 the anterior lobe is about as broad and as deep as the preceding sideplate; inferior margin rounded, with only 4-7 setæ; posterior lobe very small, only one-third the depth of the anterior, 2 small setæ inset. Sideplate 6 small; posterior lobe about half as deep as the anterior, with 1 small seta behind and 1 of the sensory serrate spines similar to those found on the hinder pereopods and uropods (see fig. 21); on the anterior lobe are 2 ciliated hairs. Sideplate 7 small and subquadrangular.

Pleon.—Segment 3 much the longest, as long as the 1st and 2nd taken together; 4th segment a little depressed dorsally. The hind margin of the 2nd is straight, that of the 3rd rounded; inferior margins of 1-3 thickly beset with long plumose setæ, most numerous on the 2nd. On either side of the median line of the 4th and 5th segments the posterior margin is produced in an erect membranaceous lappet-like process, too delicate in structure to be termed a tooth, each process having a setule inset in the notch (fig. 26). Both Costa and Grube refer to these setules,

without apparently noticing the processes*, but this oversight is very easily understood. The integument is so thin that if by any chance, such as pressure or a little mucous dirt collected, the process be flattened against the body, it is impossible to see it. The 4th segment has a group of spines on either side, just above the insertion of the uropods. The processes on the 5th segment extend beyond the very small 6th segment.

ANTENNÆ. *Superior Antenna* (figs. 1-3).—1st joint of the peduncle stout, slightly longer than the 2nd in actual measurement, the greater apparent length of the latter being due to its slenderness; in only one of the specimens, Grube's largest, the 2nd joint was a very little longer than the 1st; on the outer side are several small ciliated hairs, and a cluster of setæ with 1 long ciliated hair at the distal angle; the inner angle carries a very long, stout, outstanding sensory spine with 2 smaller ones inset beside it. The 2nd joint is only half as broad as the 1st, with a cluster of 3 or 4 setæ and 1 long ciliated hair on either distal angle. The 3rd joint in all the large specimens I have examined barely reaches half the length of the 2nd; in the smallest one it slightly exceeds half the length. The *primary flagellum* is composed of 9-14 joints; one young ovigerous female 2.5 mm. long had 9 joints; a male measuring 6 mm. had 14; Grube's large females 5.5 mm. and 6.25 mm. had respectively 12 and 10, the joints in the last-mentioned case being longer than in the other animals examined. Each joint, from the 4th in the full-grown and from the 2nd in the young, to the penultimate, is provided with a very long sensory filament in addition to the small setæ. The *accessory flagellum* is usually 2-jointed, equalling the 1st joint of the primary in length, and is so described by Norman, Della Valle, and Walker. All the specimens examined by me, except one, agree in having 2 joints only, though the length varies a little, in the small specimen (fig. 1) being slightly less than the 1st joint of the primary in length, and in the medium-sized specimen (fig. 2) slightly more. The exception is Grube's largest specimen, which has 10 joints in the primary, and a 3-jointed accessory flagellum equalling the first 2 joints of the primary in length. Costa's observation agrees with this, (19) p. 155, "Il filetto composto di dieci articoli finamente pelacciuti; il filetto accessorio lungo appena quanto due articoli del primario." Grube in his description, (24) p. 403, says: "Bei dem von mir zuerst untersuchten Exemplar fehlte den oberen Antennen die Nebengeißel. . . . An einem zweiten Exemplar fand ich die Nebengeißel und zwar eine 3-gliedrige." The first specimen examined by him (from Lussin-piccolo) had, however, an accessory flagellum, a 2-jointed one, but this, in both antennæ, had lost the

* "Quelli del quarto [abdominal segment] in oltre guerniti di piccole spine lungo il margine dorsale." Costa (19) p. 15.

"Auf dem Rücken des 11ten und 12ten Segments vor dem Hinterrande sieht man ein paar Borsten." Grube (24) p. 407.

long apical setæ, and, lying flat against the primary, was hidden by a coating of dirt. In his third specimen both the superior antennæ are missing.

Inferior Antenna.—3rd joint of the peduncle short, as broad as long, with a cluster of very long setæ on the inner angle and 1 long sensory spine above. The 4th joint is twice the length of the 3rd, slightly longer than the 5th, both beset with clusters of the long, cleft-tipped setæ and smaller setiform spines. *Flagellum* shorter than the 5th joint, composed of 4 joints, the 1st much the longest, almost equalling in length the two following taken together, each carrying, in addition to the setæ, a pair of strong spines setting out on either side. In the small specimens the flagellum is 3-jointed.

ORAL PARTS.—The description is taken from the fully adult specimens 5-6 mm. long, but the structure is precisely the same in the small animals, the only difference being the lesser number of spines and setæ.

Upper Lip (fig. 4) thick, subquadrate in form, much arched above; apex emarginate, slightly asymmetrical. In the figure the lip is turned a little upwards to show the emargination of the apex.

Lower Lip (fig. 5) as in the type species.

Mandibles (fig. 6).—*Cutting-plate* on the right mandible curved, margin divided into 3 teeth, the lowest much produced; in two specimens the margin was entire, the middle tooth not being developed; *accessory-plate* narrow, in some specimens scarcely wider than, and not as long as, the 1st spine of the spine row, produced below to an acute tooth covered with microscopic tubercles, and provided with a small tooth above. In the left mandible the *cutting-plate* has 4 teeth, the second small, the lowest the largest; the *accessory-plate* is strong, much broader than that of the right mandible, the mandible divided into 3 teeth, the upper and lower of which are large, the middle one small. There are 7 spines in the *spine-row* in Chevreux's specimens, 8 in Grube's largest, the first 3 being unusually large, wide at the base, flat and furry in appearance owing to being covered with microscopic spinules. The *molar* is very prominent; the crown transversely ridged with rows of teeth, edged with flat spinules, with 1 long, feathered seta above. The *palp* is very large; 3rd joint the longest, tipped with long serrate bristles, with a double row of smaller ones extending down the distal half of the inner margin; the outer margin has 4 groups of long serrate bristles inset.

Maxilla 1 (figs. 7-9).—*Inner plate* large, with 1 long plumose seta inset; Grube notes the absence of this seta (p. 404), but his specimen is so covered with mucous dirt as to render it difficult to see details clearly; not only is the seta present, but the new one can be seen under the old loose skin, the animal, as before stated, being ready to moult. *Outer plate* curved, with 11 strong spines, 4 of which are bifurcate (fig. 8), the rest

finely dentate (fig. 9); the outer margin is covered with fine hairs. The 2nd joint of the *palp* is expanded apically, and rounded, with a marginal row of 4 strong flat spines, and 3 plumose setæ; 2 or 3 diagonal rows of setæ are inset submarginally.

Maxilla 2 (fig. 10).—*Outer plate* the larger, covered with exceedingly fine long hairs; expanded distally, bulging behind, furnished with an apical cluster of stiff bristles, and a row of sparsely plumose setæ extending some distance down the inner margin. The *inner plate*, distally narrowed, is provided with 2 rows of setæ; one row, submarginal, consists of 20 long, delicate, finely plumose setæ; the second row contains an apical cluster of stiff setæ, with 8 inset along the margin, these latter of the same structure as the plumose ones of the outer plate. In Grube's specimen the upper portion of the inner plate has been torn away; the 2 apical setæ represented in the figure 2 m¹ are two of the plumose row of the outer plate.

Maxillipeds (figs. 11 & 12).—*Inner and outer plates* well developed, but narrow. The apices of the *inner plates* are inset with 4 long, feathered, setiform spines along the margin, with a group at the inner angle of 4 long delicate plumose setæ set together in a little hollow, 3 similar ones extending down the inner margin, and 2 submarginally on the outer side. The outer surface is longitudinally ridged. On this surface close to, but just below, the inner angle, is a small *coupling-spine* (fig. 12), stout, and bent upwards. It appears to be tuberculated on its inner side, but the detail is obscure, even with a $\frac{1}{12}$ th oil-immersion lens. The *outer plate* carries a marginal row of flat feathered spines (15 in Grube's large specimen, 13 in Chevreux's, 7 in the smallest of all), the 2 apical ones much the longest, and submarginally on the outer side a few long feathered setæ. The 2nd joint of the *palp* is the longest, in Grube's specimen twice the length of the 1st, furnished with numerous plumose setæ; the 3rd is produced over the insertion of the finger as in the type species; finger small, obtuse, carrying apically 1 long stout dentate spine, 1 smaller one, and 2 setæ in Chevreux's specimen, 3 stout spines and 4 setæ in Grube's, 1 spine and 2 setæ in Norman's.

First Gnathopods (figs. 13, 15, 17, & 18).—2nd joint narrow at the base, but widening distally; posterior margin convex, with 2-4 very long delicate setæ inset midway; anterior margin straight, carrying a row of delicate plumose setæ, another row of longer similar setæ is found on the under surface as in the type species; 3rd joint bulging behind, fringed with numerous closely set long feathered setæ; 4th joint the smallest, also fringed posteriorly with feathered setæ shorter than those of the 3rd. The 5th is considerably longer than the 6th, with 5-7 transverse rows of plumose setæ, and 5-7 clusters of rigid serrate bristles along the hind margin. 6th oblong, about twice as long as broad, with 4-5 transverse rows of setæ on the hind margin; palm short,

truncate. The long spine on the hind margin in Chevreux's figure, (16) pl. xi. fig. 2 *a*, is the longest of a group of 3 inset on the under side of the hand, and projecting beyond the hind margin. The palmar margin is mentioned by Chevreux (p. 91) as affording a distinguishing character for the two forms—concave for *pectinatus*, and convex for *dellavallei*,—but an examination of a series of specimens shows conclusively that this difference is due to sex. In the male (figs. 15 & 18) the margin is concave, and the palmar angle forms a right angle with the hind margin; in the female (fig. 17) the palmar angle is rounded, the curve commencing at the insertion of the finger, and merging imperceptibly into the hind margin. The palm is strongly serrated in all; in the female the serrations turn the corner and reach as far as the large spine just referred to. The palmar spines are of the same structure as those of the type species. The finger is more than twice the length of the palm (a little longer in proportion in the young form), curved, with a strong auxiliary claw; a long, stiff, finely serrated spine and 1 setule are inset in the notch, 1–2 setules behind the claw; the rest of the inner margin is firmly serrated.

Second Gnathopod (figs. 19 & 20) as described by Grube, Norman, and Della Valle. Figures of the finger, so characteristic of the species, are given from Norman's and Chevreux's specimens in order to show the identity of the two forms *pectinatus* and *dellavallei*. Grube's specimens agree exactly with these. In the young form the finger is slightly longer in proportion to the preceding joint than in the older animals, not equalling quite half its length in Norman's specimens, and only about one-third the length in Grube's largest.

Pereopods 1 and 2 glandular, alike in structure; 2nd joint large, fringed posteriorly with long delicate setæ, more numerous on the 2nd pereopod; anterior margins with from 4–6 similar setæ: 4th joint about half the length of the 2nd, slightly expanded distally; 5th joint narrower and shorter than 4th; 6th joint slightly longer than the 4th; the two terminal joints tapering gradually to the acute tip of the 7th; the 7th subequal to the 6th in length, with the glandular aperture opening at the tip.

Hinder Pereopods (fig. 21) more strongly built than the preceding; rapidly increasing in length. Pereopod 3: 2nd joint large, a little longer than broad, equalling in length the 3 following joints taken together; both margins convex, the anterior beset at intervals with 7 small sensory spines, the first 3 unaccompanied by setæ, the 4th with 1 seta, the 5th with 2, 6th with 3, and the distal one with 4; posterior margin produced below in a rounded lobe, crenulate, 6 of the crenulations with setules inset, the 2 crenulations on the lobe each with a ciliated hair; 3rd joint short and broad, with a cluster of setæ, 1 ciliated hair, and 1 spine; 4th joint half the length of the 2nd, stout, slightly expanded anteriorly, with the spines of the structure peculiar to the hinder pereopods and uropods (fig. 21); 5th joint

shorter than 4th, with two clusters of spines on either side; 6th about as long as the 4th, but much more slender, spinose, with groups of spines on either side and 1 very long stout spine inset behind the finger. Finger short, not half the length of the preceding joint, much curved, with 2 specialised bristles towards the apex, one on the inner side lying flat against the finger and reaching to the apex, and the other on the outer side, setting out at right angles to the finger. This one appears to have a flattened tip, and the inner one to be feathered, but the detail is almost impossible to see owing to their extreme tenuity and the angle at which they are placed. Peræopod 4 is noticeable for the great length of the spines of the 5th and 6th joints; 2nd joint rounded oval, produced behind into a rounded lobe, 8 spines along the anterior margin, the distal 5 accompanied by increasing clusters of ciliated hairs and setæ; posterior margin with 10 crenulations, and a submarginal row around the lobe of 5-8 ciliated hairs; 4th and 5th joints practically subequal to each other in length, 5th narrower than 4th; 6th considerably longer and more slender; the spines on this joint are longer than those on the 5th, 4 clusters increasing in length and number, on either side, 2 of the clusters behind the finger equalling the joint itself in length; they are very brittle, several of the specimens not having a single perfect one remaining. Finger lightly curved, of the same structure as the finger of the preceding peræopod. Peræopod 5: 2nd joint narrow proximally, widened distally; the proximal end of the posterior expansion is produced subacutely, the distal end, as in peræopods 3 and 4, forms a rounded lobe; on the posterior margin are 8 crenulations with a setule on each, and 20 ciliated hairs in a submarginal row; the anterior margin has 8 spines as in peræopod 4, and 3 long fine hairs proximally. The 4th-6th joints rapidly increase in length and decrease in width; 4th and 5th each beset with 3 groups of stout spines on either side; 6th twice the length of the 4th, with 5 groups of spines on either side, the terminal posterior group of spines and setæ of extraordinary length. Finger as in peræopod 4.

The smaller specimens agree in all details with this description, the only difference being the lesser number of spines.

Pleopod 1 (fig. 22): peduncle short, hardly half the length of the outer ramus, with about 10 long plumose setæ on the outer side; 2 small coupling-spines, and 1 long plumose seta inset together on the inner. The outer ramus 12-jointed, considerably shorter than the inner; inner ramus 14-jointed, with 4 cleft spines. *Pleopods 2* and 3 alike; peduncle more than half the length of the outer ramus, with only 2 or 3 fine hairs. The rami are shorter than in the 1st pleopod; outer ramus with 11 joints; inner with 13; 4 cleft spines in the 2nd pleopod; 2 in the 3rd.

Uropods (figs. 23-26) extend backwards to the same level. The peduncle of uropod 1 is shorter than the outer ramus, with 5 slender spines on the upper curve, and 3 inset diagonally midway on the outer surface; the falciform apical process reaches to half

the length of the outer ramus. The outer ramus is shorter than the inner, both furnished with slender spines. In uropod 2 the peduncle is almost as long as the outer ramus; outer ramus the shorter; the spines are shorter and stouter than those of uropod 1. I have figured uropod 3 in detail (figs. 23, 24, & 25), because it has been used by Norman (36, p. 89) as distinguishing the two forms. A comparison of the figures will show the identity of structure. The outer ramus has a minute apical joint carrying a long rigid spine, this joint being larger in proportion in the young form; the detail of the spines in the small specimen (fig. 23) could only be seen with the $\frac{1}{12}$ th oil-immersion.

The *Telson* (figs. 27 & 28) is of exactly the same structure in all the specimens; lateral angles greatly elevated, each produced to an acute point, each with 1 long spine and 1 short sensory ciliated hair on the margin, and 2 ciliated hairs underneath. The subacute apex curves upwards also, but not to the same degree as the lateral angles. Figure 27 is taken from Chevreux's specimen; in two of Grube's, the tip was as represented in fig. 28, in the third, the largest, it was as in fig. 27.

Colour.—Grube's largest specimen still retains its vivid colour, a yellowish tint, with markings in dark brown. The distribution of the pigment agrees perfectly with Costa's figure (19) pl. ii. fig. 8. The markings are composed of cloudy brownish patches stippled thickly but irregularly with blackish-brown spots. The dorsal part of the head is covered with dark brown pigment, shading into black near the eyes, these dark patches causing the eyes to appear larger than they really are. The 1st peraeon-segment is plain; the 2nd has only faint patches, one on the back, and one on each side; the 3rd and 4th with their corresponding sideplates, and the 5th are thickly covered with the pigment, arranged in a band along the middle of the segment; the 6th is plain; the 7th and the first 3 pleon-segments with their epimera are darkly pigmented; the 4th pleon-segment has a faint patch on each side; the rest of the animal is plain. The general effect is very striking, the animal showing a dark head, 3 dark rings anteriorly, and 4 farther back. The amount of colour probably varies with the locality. Walker, (48) p. 310, describes it as "deep yellow, with transverse brown lines on all the segments."

Distribution.—This species has a very wide distribution:—

SHETLAND ISLES: Norman (34) p. 283, as *Protomedeia pectinata*; dredged; St. Magnus Bay, deep water.

IRISH SEA: Walker (48) p. 310, as *Leptocheirus pilosus*; dredged; 17 fathoms.

W. & S. COASTS OF IRELAND: Walker (50) p. 169, as *Leptocheirus pilosus*; 40 fathoms; bottom deposit, gravel.

CHANNEL ISLANDS: Walker & Hornell (49) p. 54; as *Leptocheirus pilosus* Zadd.=*L. pectinatus* Norman; 7 fathoms; bottom deposit, gravel, clinkers, and shells. Chevreux (16)

- p. 91, as *Leptocheirus pilosus*; tidal zone; bottom deposit, rather coarse sand. Norman (37) p. 369, as *Leptocheirus pectinatus*.
- FRANCE: OCEANIC COAST: Chevreux (11) pp. 290, 309, as *Ptilocheirus pectinatus*; 10-19 m.; bottom deposit, nullipores and mud. Chevreux (15) p. 482, as *Leptocheirus pilosus*; 10-20 m.
- BAY OF BISCAY: ss. 'Huxley,' 47° 48' N.; 7° 46' W.; 109 fathoms.
- MEDITERRANEAN: Chevreux (16) p. 91, as *Leptocheirus fasciatus*.
- PROVENCE: coast of ALGERIA: CORSICA, dredged in 12 fathoms: Chevreux (17) p. 4, as *Leptocheirus fasciatus*.
- BAY OF NAPLES: Costa (19) p. 155, as *Protomedeia fasciata*. Della Valle (21) p. 430, as *Leptocheirus pilosus*; 10-20 m.; bottom deposit, sand.
- ADRIATIC: Grube (22) p. 73, as *Protomedeia pilosa*. Grube (24) p. 403, as *Protomedeia hirsutimana?* and *Pr. pilosa*.
- SENEGAL: Chevreux (in litt.).
- WASIN, BRIT. E. AFRICA: Walker (51) p. 341, as *Leptocheirus pilosus*; 10 fathoms; bottom deposit, mud.

LEPTOCHEIRUS BISPINOSUS Norman. (Plate XVIII, figs. 17-20. Text-fig. 146.)

1866. *Protomedeia hirsutimana* Heller (25) pp. 34 & 35.
1893. *Leptocheirus guttatus* Della Valle (21) p. 430, pl. xii. figs. 15-24.
1908. *Leptocheirus bispinosus* Norman (38) p. 308, pl. xii. figs. 7-9; pl. xiii. figs. 1-3.

The specimen described by Heller as *Protomedeia hirsutimana* Sp. Bate is preserved in the Hofmuseum, Vienna. The description and figures of it, most kindly sent to me by Dr. Pesta, prove it to belong to the same species as described by Norman in 1908 under the name of *L. bispinosus*.

The *guttatus* of Della Valle, in my opinion, must also be included in this species. A comparison of the two accounts, Della Valle's and Norman's, leaves no room for doubt. The only point of difference is in the number of joints in the accessory flagellum: Della Valle gives the number as 2, subequal in length, and as long, taken together, as 2 joints of the primary flagellum; Norman as 5, as long as 3 joints of the primary. It seems probable, either that Della Valle had a young specimen before him with only two joints developed, or, what I think more likely, that the accessory flagellum was broken. In the other specimens of this species (and, indeed, in all the specimens of this genus that I have examined) the terminal joint of the accessory flagellum is very small and tipped with long setæ, but Della Valle says definitely that the 2nd joint in his specimen was equal in length to the 1st, and in his figure he shows only 2 small setæ instead of the usual long apical cluster. I have added below some details to the description given

ly Canon Norman for the sake of a more complete comparison with Della Valle's account.

The species resembles *guttatus* Grube in many respects, the principal distinguishing points being:—the proportions of the antennæ; the hand of gnathopod 1; sideplate 2; the shape of the basal joints of the hinder peræopods; the armature of the pleon; and uropod 3.

Description (taken from the type specimen of *bispinosus*, a female, which Canon Norman kindly allowed me to examine):—

Head longer than peræon-segments 1 and 2 taken together; lateral corners rounded.

Eyes very large; pigment brownish black; ommatidia large.

Sideplate 1 free of sideplate 2, about half its width, but not equalling it in length, a little expanded distally and fringed with long setæ. Sideplates 2-5 much as in the type species for shape. The 2nd is the largest and deepest, much deeper than the corresponding body-segment; expanded inferiorly, hind margin straight, inferior margin rounded and fringed with numerous plumose setæ (*cf.* text-fig. 146, *f*, with Norman's pl. xiii. fig. 2 and Della Valle's pl. xii. fig. 17). The 3rd is deeper than the 4th; and the 4th a little deeper than the 5th; all fringed inferiorly with setæ.

Pleon.—Segment 3, hind margin produced, rounded, crenulate; crenulations 8 in number, each with a setule; inferior margin concave, furnished with numerous strong sensory spines submarginally. Pleon-segment 4 as described by Norman, with "a strong and acute angular backward projection on each side"; Dr. Pesta's account agrees with this, "das 4. Pleonsegment hat 2 seitliche nach aufwärts geschwungene 'angles'" (text-fig. 146, *g*); Heller erroneously notes them as occurring on the 5th. The 5th, indeed, carries 2 dorso-lateral angles (as stated by Della Valle), but these are exceedingly small and difficult to see *in situ*, not much produced, acute, each with a seta inset behind.

ANTENNÆ (text-figure 146 *a, b*).—*Superior Antenna*, as figured by Della Valle: 1st joint of peduncle shorter and broader than the 2nd, carrying a stout spine on the inner distal angle; 3rd a little more than one-third the length of the 2nd; *primary flagellum* with 16 joints, each, from the 3rd, with a small sensory filament; Dr. Pesta says of Heller's specimen that the number of joints on the right side is 17, on the left 18. The *accessory flagellum* in Norman's specimen extends to the 3rd joint of the primary, 5-jointed, the first 4 joints subequal to each other in length, the terminal one minute, tipped with long setæ; in Heller's specimen it does not reach to the distal margin of the 3rd joint of the primary, "4-gliedrig, jedoch ist das Endglied rechts kürzer als links."

Inferior Antenna: 4th joint longer than 5th; flagellum about the same length as the 5th, composed of 7 joints, the first as long as all the others taken together.

First Gnathopod (Pl. XVIII. fig. 17): 3rd and 4th joints more densely setose than in the other species, the plumose setæ being

arranged in transverse rows in addition to the marginal fringe. 5th joint slightly longer than 6th; 6th twice as long as broad, widening a little towards the palm. The palmar margin is convex, its limit defined, as in the preceding species, by a long sensory spine inset on the under surface; on the outer surface it carries a submarginal row of about 10 strong sensory spines, and on the inner side a thick row of setiform spines. The finger when closed reaches to the large spine; it is curved, with a strong auxiliary tooth subapically, and 6 smaller teeth on the inner margin, each tooth with a setule beside it. In the notch near the apex 2 or 3 longer setules are inset.

Dr. Pesta's description is as follows (text-fig. 146, *d*): "das Handglied des 1. *Gnathopoden* ist vorne etwas verbreitert, die Klaue so lang wie die konvexe Seite desselben; der konvexe Rand die 'Hand' besitzt eine Reihe von kräftigen Dornen, die gegen die Klaue gerichtet sind."

Second Gnathopod (fig. 18): 2nd joint unusually long, equalling in length the joints 3-6 taken together; 3rd, 4th, and 5th joints subequal to each other measured along the inner side. The finger is nearly straight, about half the length of the preceding joint; "leicht gebogen und spitz" (text-fig. 146, *e*).

Peræopods 1 and 2.—The length of the 4th joint forms a distinguishing character for this species. The peræopods are about the same length, but in peræopod 1 the basal joint is longer than in peræopod 2; and the 4th joint is longer in the latter than in the former, being equal to the basal joint in length. Dr. Pesta says "das 4. Glied des 1. *Peræopoden* ist länger als das 6. Glied und fast so lang wie das 2. Glied." (Cf. text-fig. 146, *c*, with Norman's pl. xii. fig. 8 and Della Valle's pl. xii. fig. 24.) The 2nd joint carries posteriorly numerous delicate sensory setæ, some of great length; 4th joint long, of equal breadth throughout; 5th about half as long as the 4th; 6th longer than 5th, both with clusters of long sparsely feathered setæ posteriorly; finger shorter than the 6th, subequal to the 5th in length, with the glandular aperture opening at the tip.

Hinder Peræopods (fig. 19) as figured by Della Valle. In peræopod 3 the basal joint has the posterior margin straight and crenulate; in peræopod 5 the posterior expansion of this joint is much wider distally than at the base, and the margin is rounded and serrate, the lower portion carrying numerous plumose setæ. Fingers curved and falciform. In Heller's specimen, peræopod 3 is missing, but Dr. Pesta says of the last two pairs "die Endklauen sind einfach (nicht 'bifid')," as in Spence Bate's *hirsuti-mana*. In Norman's figure, pl. xii. fig. 9, the terminal joints are lying in such a position as to quite conceal the spines. I have therefore refigured them to show the armature.

Uropods 1 and 2 (text-fig. 146, *g*) much as in *guttatus* Grube; very spinose, the spines of uropod 2 shorter and much stouter than those of uropod 1. The falciform process of the peduncle reaches, in uropod 1, to the tip of the outer ramus; in uropod 2 beyond the tip. The inner rami differ from the other species in having

slender, feathered setæ, or setiform spines, in addition to the other spines. These are found on the under margin, 3 in uropod 1, short, inset at intervals, and 2 clusters of long ones in uropod 2, near the apex. In uropod 3 (fig. 20) the outer ramus is furnished with an apical cluster of 5 spines and 3 or 4 long feathered setæ similar to those of the 2nd uropod, and 1 cluster of small spines midway, in Norman's specimen (2 clusters figured by Della Valle, probably from an older specimen); the inner ramus is tipped with 1 stout spine and 1 seta, with 1 spine midway, in Norman's specimen (2 in Della Valle's).

Telson.—The apical margin of the telson is represented in Della Valle's figure as truncate, but, as in *guttatus* Grube, this appearance is due to the angle at which it is carried. The margin is really convex, but as in the natural position it is a little bent in under, the convexity is not apparent from the dorsal view.

Colour given by Della Valle as greyish yellow without markings; by Dr. Pesta as "gelbbraun, Auge schwarz"; but, he adds, "diese Färbung dürfte nicht natürlich sein."

Distribution :—

BAY OF BISCAY: Norman (38) p. 309, as *L. bispinosus*, depth 35-60 fathoms.

NAPLES: Della Valle (21) p. 432, as *L. guttatus*; bottom deposit, corallines.

ADRIATIC at Lesina: Heller (25) p. 35, as *Protomedeia hirsutimana*.

GULF OF BONE and Coast of TUNIS: Chevreux (18) p. 3, as *L. bispinosus*.

The only details given by Catta concerning his species *massiliensis*, viz. the nature of the ground on which it was captured "fonds coralligènes," and the colour, "un beau jaune, tandis que l'œil était complètement noir," would seem to point to *L. bispinosus*.

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EXPLANATION OF THE PLATES.

PLATE XVII.

Leptocheirus pilosus Zaddach.

Fig. 1. Whole animal, Zaddach's specimen, young ♀	× 42.
2. Superior antenna, seen from above, young ♀	Zaddach's specimen.	× 50.
3. Part of inferior antenna.....	" " " "	× 50.
4. Upper lip.....	" " " "	× 95.
5. Lower lip.....	" " " "	× 95.
6. Mandible.....	" " " "	× 95.
7. Maxilla 1'.....	" " " "	× 95.
8. Maxilla 2.....	" " " "	× 95.
9. Maxillipeds.....	" " " "	× 95.
10. First gnathopod.....	" " " "	× 50.
11. Hand of the first gnathopod. ♀	Norman's specimen	× 50.
12. " " " " ♂	Chevreux's " "	× 50.
13. Finger of first gnathopod. Large ♀	" "	× 95.
14. " " " " ♂	" "	× 95.
15. Serrate bristle from 5th joint, first gnathopod. Large ♂	Chevreux's specimen.	× 175.
16. Second gnathopod. Young ♀	Zaddach's specimen	× 50.
17. Finger of second gnathopod. Young ♀	Zaddach's specimen	× 140.
18. " " " " ♀	Norman's " "	× 140.
19. First peræopod. Young ♀	Zaddach's specimen	× 50.
20. Second " " " " " "	" " " "	× 50.
21. Third " " " " " "	" " " "	× 50.
22. Fifth " " " " " "	" " " "	× 50.
23. Fifth peræopod, under surface. Large ♂	Chevreux's specimen	× 40.
24. Upper coupling-spine, first pleopod. Young ♀	Zaddach's specimen.	× 290.
25. Telson and third uropods, dorsal view. " " " "	" " " "	× 50.
26. Telson, lateral view. Young ♀	Zaddach's specimen	× 50.

PLATE XVIII.

Fig. 1. Whole animal. Grube's type specimen	..... <i>Leptocheirus guttatus.</i>	× 20.
2. Accessory flagellum, right antenna. Norman's specimen	.....	× 75.
3. Accessory flagellum, left antenna. Same specimen	.....	× 75.
4. Accessory flagellum, right antenna. Another specimen, ♀	.....	× 75.
5. Hand and finger, first gnathopod. Chevreux's specimen, ♀	.....	× 75.
6. Finger of second gnathopod. Chevreux's specimen, ♀	.....	× 75.
7. One of the smaller apical spines, uropod 2. Norman's specimen	.....	× 265.
8. Third uropod, drawn <i>in situ</i> . Grube's specimen	.....	× 75.
9. Apical margin of telson, a little upturned. Grube's specimen	.....	× 75.

Fig. 10. Hand of first gnathopod, ♂, looking down on the hind margin, from a specimen from Vineyard Sound	<i>Leptocheirus pinguis.</i>	× 22.
11. Finger of second gnathopod, same specimen.	" "	× 27.
12. Second joint, without the bristles, uropod 3, ♀, Vineyard Sound	" "	× 75.
13. Finger of first gnathopod, small specimen, 4 mm., from Banff	<i>Leptocheirus hirsutimanus</i>	× 58.
14. Tip of finger, second gnathopod, small specimen, 4 mm., from Banff	" "	× 145.
15. Finger of third pereopod, large specimen, 10 mm., Shetland Isles, 1867	" "	× 145.
16. Outer ramus, third uropod, small specimen, 4 mm., Banff	" "	× 58.
17. Hand and finger, first gnathopod, ♀. Norman's type specimen	<i>Leptocheirus hispidus.</i>	× 50.
18. Finger of second gnathopod, ♀. Norman's type specimen	" "	× 50.
19. Terminal joints, fifth pereopod, ♀. Norman's type specimen	" "	× 28.
20. Uropod 3, ♀. Norman's type specimen ...	" "	× 50.

PLATE XIX.

Leptocheirus pectinatus Norman.

Fig 1. Accessory flagellum, superior antenna. Norman's specimen, ♂	× 145.
2. " " " " Chevreux's specimen, large ♂	× 75.
3. " " " " Grube's largest specimen, ♀	× 75.
4. Upper lip	Chevreux's specimen, large ♂. × 75.
5. Lower lip	" " " " × 75.
6. Mandible	" " " " × 75.
7. Maxilla 1	" " " " × 75.
8. Bifurcate spine, outer plate, maxilla 1.	" " " " × 435.
9. Dentate spine, " " " "	" " " " × 435.
10. Maxilla 2	" " " " × 75.
11. Maxillipeds	" " " " × 75.
12. Coupling-spine, inner plate, maxillipeds.	" " " " × 435.
13. First gnathopod (the feathering of the setae on joints 3-6 not shown). Norman's specimen, young ♂, 2.5 mm.	× 95.
14. First sideplate	" " young ♀, 2.75 mm. × 95.
15. First gnathopod. Chevreux's specimen, large ♂, 5.25 mm.	× 40.
16. First sideplate. Grube's specimen, large ♀	× 40.
17. Finger and palm, first gnathopod. Grube's specimen, large ♀	× 95.
(The other setae omitted in order to show the palmar spines clearly.)	
18. Finger and palm, first gnathopod. Chevreux's specimen, large ♂ ...	× 95.
19. Finger of second gnathopod. Norman's specimen, ♂	× 290.
20. " " Chevreux's specimen, ♀	× 145.
21. Sensory spine, 6th joint, pereopod 4, " " " "	× 300.
22. Tip of 4th cleft spine, pleopod 1. " " " "	× 300.
23. Third uropod. Norman's specimen, young ♀, 2.75 mm.	× 290.
24. " " Chevreux's specimen, large ♂, 5.25 mm.	× 95.
25. " " Grube's specimen, large ♀	× 75.
26. Uropods and telson. Chevreux's specimen, large ♂, 6 mm.	× 40.
27. Apex of telson. " " " "	× 58.
28. " " Grube's specimen, ♀, 5.5 mm.	× 58.